

Work-Related Musculoskeletal Symptoms Reported by Female Flight Attendants on Long-Haul Flights

HYEONKYEONG LEE, JOELLEN WILBUR, KAREN M. CONRAD,
AND DINKAR MOKADAM

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Introduction: Flight attendants working on long-haul international commercial airline operations exposed to ergonomic stressors are likely to experience work-related musculoskeletal symptoms (WMS). To date, however, no studies investigating the extent of WMS experienced by this specific population have been published. The purpose of this study was to identify the prevalence and severity (frequency, duration, and intensity) of WMS experienced by female flight attendants working on long-haul international flights for one major airline. **Methods:** A cross-sectional, mailed survey was conducted with female flight attendants randomly selected from a union membership list. Inclusion criteria were female flight attendants who had worked at least one long-haul international flight in the prior 3 mo and had worked at least 75 flight hours in the prior month. A total of 185 eligible flight attendants returned completed questionnaires (63% response rate). WMS in nine body regions were measured by the Nordic Musculoskeletal Questionnaire and the National Institute for Occupational Safety and Health Symptom Survey. **Results:** The prevalence of WMS by body region ranged from 50% to 86%. Almost all (97%) of the flight attendants in this study experienced some level of WMS during the past year. The WMS tended to involve more than one body region, and the lower back was the most commonly affected body region. **Discussion:** Female flight attendants working on long-haul international flights at one major airline showed a high prevalence of WMS, suggesting the need for replication studies with other airlines and the need for investigation into the risk factors associated with this substantial problem.

Keywords: work-related musculoskeletal symptoms, flight attendants, long-haul flights.

ACCORDING TO THE BUREAU of Labor Statistics (2), work-related musculoskeletal injuries and illnesses accounted for about 33% of the total lost workdays for flight attendants working in the scheduled air transportation sector (Standard Occupational Code 39-6031). In the flight attendant population, the median number of lost workdays as a result of work-related injuries and illnesses was about four times higher than the median number of lost workdays for other female-dominated occupations, such as registered nurses and nursing aides (3). In fact, the tendency by workers to underreport work-related injuries and illnesses to the Occupational Safety and Health Administration (OSHA) (10) suggests that the number of actual cases may be significantly higher. Although work-related musculoskeletal injuries and illnesses have been a major health problem for U.S. flight attendants as reported above (2,3), little is known about the range of the problem including presence, location, and severity (fre-

quency, duration, and intensity) of musculoskeletal symptoms.

Only a few published studies have investigated work-related musculoskeletal symptoms in the flight attendant population in the last decade. In earlier population surveys (5,6,12,14), musculoskeletal symptoms were reported among a wide range (3–87%) of the flight attendant population, who are mostly female. This widely ranging prevalence of musculoskeletal symptoms is, in part, due to differences in the study purpose and methods such as body region of interest and definition of musculoskeletal symptoms. In the study by Morley-Kirk (14), with the largest sample size among the four studies ($n = 674$), the proportion of individuals who had musculoskeletal symptoms in any body region was estimated at 87%; however, this study did not report the specific body region affected. In two other studies (6,12) that broke down the problem by body region, the prevalence of musculoskeletal symptoms ranged from 3% to 58%. The trunk region, including neck, shoulder, and back, was the most commonly affected body region and the percentages of flight attendants who experienced musculoskeletal symptoms in these regions ranged from 22% to 58%. In another study with a random sample (5), the prevalence of back pain that lasted at least 1 wk during the past year and occurred once a month was up to 61%. The findings from those studies indicate that work-related musculoskeletal symptoms, particularly in the trunk body region, are substantial in the flight attendant population. However, these studies are limited in the sense that none of them comprehensively examined the presence, location, and severity of musculoskeletal symptoms with a large random sample.

From the University of Illinois at Chicago College of Nursing, Chicago, IL (H. Lee and J. Wilbur); University of Illinois at Chicago School of Public Health, Chicago, IL (K. M. Conrad); and Association of Flight Attendants-Communications Workers of America, AFL-CIO, Air Safety, Health and Security Department (D. Mokadam).

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Address reprint requests to: Hyeonkyeong Lee, Ph.D., R.N., PMA College of Nursing, University of Illinois at Chicago, 845 S. Damen Ave., Chicago, IL 60627; hlee39@uic.edu.

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Two studies (5,6) that analyzed the prevalence of musculoskeletal symptoms in flight attendants by gender found that female flight attendants were more likely to experience musculoskeletal symptoms than male flight attendants. Particularly in the study by Haugli et al. (6), the musculoskeletal problems were more prevalent in flight crews, including both pilots and flight attendants, on long-haul flights than those who worked short-haul flights. Thus, the evidence suggests that the prevalence of work-related musculoskeletal symptoms is likely to be higher among female flight attendants on long-haul international flights than among those who work on short-haul flights. Flight attendants who work for scheduled, commercial air transport operators conducting long-haul international flights routinely encounter various ergonomic stressors: job tasks (e.g., pushing/pulling carts, overhead reaching, and prolonged standing) (5,9,12); psychological stress (e.g., insufficient time to get the job done, concerns about terrorism and turbulence) (9,13); and uncomfortable physical environment in the cabin (e.g., low humidity, prolonged noise, whole body vibration) (8,9). These unique working conditions are likely to place them at increased risk for work-related musculoskeletal symptoms. To date, no study of work-related musculoskeletal symptoms, to our knowledge, has been conducted with this specific population. Identification of the scope of the problem is an important first step in the process to reduce the incidence and prevalence of musculoskeletal symptoms in flight attendants.

The purpose of this study was to identify self-reported presence, location, and severity (frequency, duration, and intensity) of work-related musculoskeletal symptoms among female flight attendants working on long-haul international flights for one major airline.

METHODS

Design and Subjects

This study used a randomized, cross-sectional mailed survey design. Eligibility criteria included female flight attendants who had worked at least one long-haul (6 h or more) international flight in the prior 3 mo and worked at least a 75-h schedule in the prior month. Subjects were drawn from one major U.S. airline that operates significant numbers of long haul international flights out of 8 base cities in the U.S. Subjects are all members of a union that represents over 46,000 flight attendants employed by 26 airlines in the U.S. A total of 2754 female flight attendants from this airline who had flown an international flight in a given month were identified from the union membership. This was used to obtain a systematic random sample of 420 flight attendants.

The data were collected between January and April 2005 via four mailings, including two follow-up surveys and one postcard-reminder. All survey packets (a cover letter, a survey questionnaire with eligibility screening questions, and a stamped return addressed envelope) prepared by the investigators were distributed by the union and returned directly to the principal investigator. A letter of support from the union presi-

dent, stating the importance of the study and encouraging potential participants to participate in the study was included in the survey packet. The survey was voluntary and the data were kept confidential with no identifying information that could be traced to participants. Identification numbers printed on the questionnaires were only used to identify non-respondents for follow-up mailings. Once the investigator received completed questionnaires from the respondents, the identification numbers were cut off the questionnaires. The research protocol was approved by the Institutional Review Board of the University of Illinois at Chicago.

Measurements

Work-related musculoskeletal symptoms (ache, pain, or discomfort) that subjects experienced during the last 12 mo were measured by two validated instruments: the Nordic Musculoskeletal Questionnaire (NMQ) (7) and the National Institute for Occupational Safety and Health (NIOSH) Symptom Survey (1). The presence of musculoskeletal symptoms was measured by a modified question derived from the NMQ. Respondents were asked to indicate if they had experienced ache, pain, or discomfort in nine body regions (neck, shoulders, upper back, lower back, wrists, elbows, hips, knees, and ankles) at any time during the prior 12 mo that they considered work related. This was accompanied by a picture of a body map. If the respondent answered "yes" to the question, then she was instructed to continue with the questions of further symptom severity (frequency, duration, and intensity) derived from the NIOSH Symptom Survey.

The frequency of the symptoms during the last 12 mo was rated on a 5-point scale: 1 = almost never (every 6 mo), 2 = rarely (every 2–3 mo), 3 = sometimes (monthly), 4 = frequently (weekly), and 5 = almost always (daily). For the purpose of analysis, the ratings of "almost never (every 6 mo)" and "rarely (every 2–3 mo)" were grouped together into a new category called "seldom" and those of "sometimes (monthly)" and "frequently (weekly)" were combined into a new category called "frequently." The duration of the symptoms was rated on a 7-point scale (< 1 h, 1 h to 1 d, > 1 d to 1 wk, > 1 to 2 wk, > 2 to 4 wk, > 1 to 3 mo, and > 3 mo) and the ratings were re-classified into three categories: "≤ 1 wk," "> 1 wk to 3 mo," and "> 3 mo." The intensity of the symptoms was rated on a 5-point scale (no pain, mild pain, moderate pain, severe pain, and worst pain ever experienced). The rating of "no pain" was combined with "mild pain" and "worst pain ever experienced" was combined with "severe pain."

The survey also collected data on various personal factors including age, years of employment as a flight attendant, work pattern (continued to work, taken 1–5 yr off from work, and taken more than 5 yr off from work) (15), average flight hours per month, flight hours per segment (defined as "an individual nonstop flight between two cities") (4), and base (domicile) city.

Analyses

The prevalence of musculoskeletal symptoms during the past year was calculated as a percentage. The fre-

quency, duration, and intensity of symptoms were reported by the frequency and percentage in each of nine body regions.

RESULTS

Of the 420 questionnaires distributed, 276 (66%) were returned. Among the 276, there were 10 refusants who returned blank questionnaires, 79 ineligible (no long-haul flights in the prior 3 mo [$n = 35$], less than 75 flight hours in the prior month [$n = 44$]), 2 eligible but incomplete and 185 eligible and complete. There were no returned questionnaires because of wrong addresses. The overall eligibility rate was 70% and was computed by dividing by the number of eligible cases by the number of completed eligibility questionnaires (187/266). Of those 187 eligible participants, two did not complete the questionnaire and were excluded from the final analysis.

The response rate was 63% and was computed by dividing the number of completed questionnaires by the number of eligible questionnaires (185/[187 + 108]), assuming the same eligibility rate of 70% ($n = 108$) for flight attendants who did not respond to the eligibility questionnaire ($n = 156$). There were no significant differences between the demographic characteristics (age, years of employment, and base city) of the sample ($n = 185$) and the non-respondents (flight attendants who did not complete questionnaires [$n = 154$] or returned incomplete questionnaires [$n = 2$]) (8).

The majority (82%) of the women were over the age of 50 with a mean age of 54.0 (SD = 6.2), ranging from 32 to 68 yr. The mean length of employment as a flight attendant was 30 yr or more, ranging from 7 to 43 yr. Of the participants, 56% ($n = 104$) had continued to work without interruption since they first became a flight attendant, and only a few ($n = 5$) had taken more than 5 yr off from work. On average, the flight attendants worked 87 flight hours per month, ranging from 65–103 h and 11 flight hours per segment, ranging from 6 to 16 h. Over 80% of the flight attendants were assigned to four of eight base cities: San Francisco (29.2%), Chicago

(27.0%), Los Angeles (15.7%), and Washington, D.C. (12.4%).

For each of nine body regions over 50% of the women reported the presence of symptoms of ache, pain, or discomfort in the prior 12 mo that was work related (Table I). The largest percentage of women experienced symptoms in the lower back followed by wrists, neck, and shoulders. More than half of the flight attendants who reported the presence of symptoms in each of nine body regions experienced the symptoms “frequently” (weekly or monthly) or “almost always (daily).” The percentage of women reporting experiencing symptoms “almost always (daily)” was highest for the ankles, wrists, and lower back. For all of the body regions over half of the women reported that the symptoms had durations of 1 wk or less. The percentage of women reporting symptoms lasting more than 3 mo was highest for the ankles and wrists. The percentage of the flight attendants who reported experiencing the most intense symptoms ranged from a low of 7% for upper back to a high of 22% for the lower back.

The majority (97%) of the flight attendants had experienced musculoskeletal symptoms in at least one body region during the past year. Three in four flight attendants experienced musculoskeletal symptoms in five or more body regions. One in three flight attendants reported experiencing symptoms in all nine body regions.

DISCUSSION

This study was undertaken to gain a better understanding of the presence, location, and severity (frequency, duration, and intensity) of work-related musculoskeletal symptoms experienced by female flight attendants working on long-haul international flights. Remarkably, almost all of the flight attendants in this study experienced some level of work-related musculoskeletal symptoms in the nine body regions of the trunk, upper extremities, and lower extremities during the past year. When compared with the general population participating in the National Health Interview Survey in 2004 (11), the percentages of the female flight

TABLE I. PRESENCE, FREQUENCY, DURATION, AND INTENSITY OF SYMPTOMS REPORTED BY 185 FLIGHT ATTENDANTS BY BODY REGION.*

	Lower back	Wrists	Neck	Shoulders	Ankles	Knees	Upper back	Hips	Elbows
Individuals reporting symptoms (N)	159	152	147	141	140	131	124	109	93
Frequency (%)**									
Seldom	12.6	15.8	17.0	14.9	10.0	20.6	15.4	37.6	41.9
Frequently	53.4	50.0	54.4	56.6	42.9	55.0	65.5	43.1	37.6
Almost always	32.1	32.9	28.6	29.8	45.7	22.9	16.9	17.4	17.2
Duration (%)**									
≤ 1 week	61.0	55.9	63.9	63.1	57.2	65.7	64.4	65.1	60.2
> 1 week to 3 months	14.5	15.8	9.6	10.6	6.4	11.5	12.9	11.0	12.9
> 3 months	20.1	23.0	21.1	22.0	32.1	18.3	13.7	16.5	11.8
Intensity of symptoms (%)**									
Mild	27.1	36.8	34.7	39.7	32.8	45.8	41.9	56.0	50.6
Moderate	44.0	34.9	42.9	39.0	43.6	36.6	41.9	22.9	30.1
Severe	22.0	19.0	15.7	14.9	17.9	12.3	7.2	13.7	7.6

*The nine body regions are arranged in descending order of the percentage of flight attendants reporting the presence of the symptoms in the past year.

**Percentages are based on the total number of responses within each body region category, and may not add up to 100 due to missing values.

attendants in the current study who experienced neck and lower back symptoms were higher than U.S. male and female adults combined within a similar age group (45–64 yr) (80–86% vs. 19–31%, respectively). The overall prevalence of musculoskeletal symptoms in the current study was also higher than that found in a large flight attendant survey (14) (97% vs. 87%, respectively). By body region, the percentages of the flight attendants with musculoskeletal symptoms (50–86%) in the current study were much higher than reported by female flight attendants with Scandinavian Airline System Norway, in which symptom presence ranged from 21% to 58% (6). The current study suggests that work-related musculoskeletal symptoms are very common health problems in a group of female flight attendants who are primarily middle-aged and work on long-haul flights.

The difference in prevalence of work-related musculoskeletal symptoms between the earlier flight attendant surveys (5,6,12,14) and the current study might be due at least in part to the differences in sample age and duration of work experience as flight attendants. The previous studies included flight attendants on both long- and short-haul flights; whereas the current study targeted only flight attendants on long-haul international flights who tended to be older because their flight schedules are determined by a seniority-based bidding system. For flight attendants at the airline studied, long-haul international flights are perceived to be more desirable assignments based on a preference for overseas travel and higher pay than domestic flights. Flight attendants in the current study sample have been in their jobs for most of their adult lives, with an average of 30 yr on the job. Thus, the high prevalence of work-related musculoskeletal symptoms observed in this study may be the result of accumulated exposure to physical and environmental stressors.

However, the results of this study need to be interpreted with caution. Although we asked subjects to report musculoskeletal symptoms that they considered work related, it is possible that the musculoskeletal symptoms flight attendants reported were due to co-existing health problems (e.g., arthritis, osteoporosis associated with declining hormonal levels following menopause). Because the majority of flight attendants in this sample were middle-aged women, it is anticipated that they would have other such health problems that tend to be more prevalent in this age group than those who are young (16). Such problems might worsen with work and, thus, the flight attendants in this study may have overestimated their symptoms due to work-related musculoskeletal symptoms. Further research will be required to estimate the extent and effects of co-existing health problems on the reporting of work-related musculoskeletal symptoms by flight attendants.

As shown in other studies of flight attendants (6,12), trunk (neck, shoulder, and back) symptoms were more prevalent than symptoms that affect other body regions. In particular, the lower back was where the flight attendants experienced the most severe symptoms in the current study. The high prevalence and severity of lower back symptoms could have been the result of frequently performed job tasks that required postural

stress (e.g., prolonged standing, bending) and force (e.g., pushing heavy carts) on the spine during long-haul international flights. This study suggests the need for further investigation to identify specific job tasks that may place flight attendants at risk for work-related musculoskeletal symptoms in the back region.

This study revealed the chronicity (lasting symptoms > 3 mo) of many of the flight attendants' musculoskeletal symptoms, particularly in the wrists, ankles, and trunk (neck, shoulders, and lower back). In particular, ankle symptoms were the longest lasting symptoms experienced by the study population. Erratic schedules of flight attendants working on international flights may be one plausible reason for the long-lasting musculoskeletal symptoms because they frequently leave where they are based and may not have consistent medical follow up for the problem. Such chronic musculoskeletal symptoms place flight attendants at risk for functional consequences such as decreased productivity, lost or restricted time from work, and temporary or permanent disability. Further research is needed to evaluate the relationships between affected body regions and severity of symptoms as they determine the functional consequences of work-related musculoskeletal symptoms on the flight attendant workforce.

As seen in this study, which targeted flight attendants working on long-haul international flights, the proportion of flight attendants over age 50 is remarkably high. At least at this airline, the job of flight attendant is now considered a long-term career, which is in contrast to the high turnover rates during the early years of commercial aviation. At many U.S. airlines, flight attendants now continue to work as long as they are willing and able. Thus, it is suggested that in planning intervention programs to prevent work-related musculoskeletal symptoms, airline occupational health professionals need to take this change in flight attendant demographics into consideration. Although preventive strategies should be incorporated at all stages of a working life, ergonomic interventions need to focus on minimizing physical and environmental stressors such that flight attendants are able to manage the workload and maintain symptom-free musculoskeletal function over the course of their careers.

The findings of this study have limited generalizability to flight attendant populations beyond the specific flight attendant group on which this study is based. One reason is that the study was conducted at only one airline; different types and levels of exposure and company culture could significantly affect the results. For example, the scheduling system that assigns most international flights to senior flight attendants may differ at other airlines. In addition, the voluntary nature of the study introduces the potential for self-selection bias, as it is possible that flight attendants with musculoskeletal symptoms are more conscious of their symptoms and therefore more likely to participate in the study. This might result in overestimates of true prevalence and severity of symptoms. Conversely, those flight attendants with longevity may represent a "healthy worker effect" such that those with debilitating symptoms are no longer employed in this position.

In conclusion, this study showed high prevalence of work-related musculoskeletal symptoms among female flight attendants on long-haul international flights at one major airline. The work-related musculoskeletal symptoms involved multiple body regions and tended to be quite long lasting, suggesting a chronic nature. The lower back was the most commonly affected body region with the highest intensity of symptoms, while the ankle was the body region where the longest lasting symptoms occurred. The findings provide an overall picture of the work-related musculoskeletal symptoms in this specific occupational group at one major airline. There is a need for replication studies with other airlines and a need for the investigation into the risk factors associated with this substantial problem.

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